Remarks

To follow the interviews after the final O.A. with two new references, by the above amendment, but without raising any new issues, Applicant

(1) cancels previously existing Claims 23, 27 and 29;

(2) corrects previous typographical spelling error "perform" of "preform"; and

(3) limitedly amends Claims 21-22, 24-26, 28 and 33-34, but without raising any new issues, by

a. deleting words "geometrical" and "parameter" in the term "geometrical shape parameter" in Claims 21, 22 and 25;
b. moving partial segments of dependant Claims 23 and 24 to independent Claim 21, as
"the control process controls at least one member of the group comprising:
a feeding speed control of said preform, a drawing speed control of said optical fiber, and a tension control of said optical fiber" from Claim 23, and
"measuring the outer diameter of said optical fiber at a position below the furnace" and "the measured outer diameter of said optical fiber, a predetermined nominal preform value and a predetermined nominal fiber value" from Claim 24;
c. deleting partial features of dependant Claim 25 since corresponding features have been moved into Claim 21 from Claim 24,
d. moving some segments of dependant Claim 27 to independent Claim 26, to specify the first and second bare fiber measurement locations in Claim 26 as previously claimed in Claim 27;
e. modifying Claim 33 in support of Substance of Interview of 3-15-2005 to limit the claim to a specific algorithm; and
f. deleting some words and clarifying "historical measurement data" in Claim 34;

to narrow the related claims for reflecting superior embodiments, and to define the invention more clearly, particularly and distinctly so as to overcome the technical rejections.

The amended claims do not contain any new limitations or radical changes that would raise new issues, i.e., there is no any new issue in the amendments.

Applicant respectfully request for reconsideration.

I . Response to the Claim Rejections – 35 USC §112

All comments regarding 35 USC 112 have been taken into consideration and amending claims to overcome the rejections. Applicant respectfully requests reconsideration of these rejections, as now applicable to claims 21-22, 24-26, 28 and 32-34, for the following reasons:

1. The final O.A. (p.2) rejected Claims 21-25 under 35 USC 112 as no support and unclear for the claimed "geometrical shape parameter" of claim 21.

   The term "geometrical shape parameter" has been amended and recovered back to "shape" in Claims 21-22 and 25 in order to overcome the rejection, even though it was thought that the Specification describes monitoring shape of the preform, e.g., in paragraph 0041, and "geometrical shape parameter" is understandable from the shape to one skilled in the relevant art. Applicant follows the final O.A. to amend these claims by deleting the words "geometrical" and "parameter".

2. Regarding the support for the specific "position" at lines 2-4 of claim 25 as asked in the final O.A. (p.3), applicant points out that the specific "position" in Claim 25 is

   "at a position at which shrinkage of the outer diameter of said optical fiber is not larger than a predetermined allowable diameter deviation value of said optical fiber".

   The Specification (paragraph 0048, lines 6-8) recites "at a position at which shrinkage of the outer diameter of the optical fiber, while stretched, is not larger than the bare fiber diameter accuracy requirement". Thus, the Specification supports the specific "position" in Claim 25.

3. The final O.A. (p.3) rejected Claims 21-25 under 35 USC 112 as being unclear for the last 4 lines "process will be ... controlled" of claim 21.

   The last 4 lines of Claim 21 are "whereby said optical fiber drawing process will be robustly controlled with robust performance of said process and robust quality of said optical fiber [[,]] against deviations of the preform outer diameter and shape at different locations and against deviations of various preforms, making a robust diameter-controlled optical fiber".

   Here, the "whereby" clause specifies the advantage of the invention to the fiber drawing process, and the value of the invention.

   For further clearness, a "comma" before "against" is deleted, in order to closely show that the robustly controlled process is "against deviations of the preform outer diameter ...".

4. The final O.A. (p.3) comments that "Claim 25, line 8 starts out, 'based on ...'. It is unclear what is based on the measured diameter. Furthermore, line 8 refers to a "perform": it is unclear if this is suppose to be a 'preform' or something else."

   The line break before "based on" has been deleted. It is the "control signals" based on the measured diameter.

   The word "perform" should read "preform". Applicant thanks the Examiner for this comment to let Applicant correct the same typographical error in the claims due to an "AutoCorrect" function of the computer between "preform" and "perform".

5. Claim 24, lines 7-10, has been amended to overcome the rejection (final O.A., p.4, lines 1-4) as follows:

   "generating control signals based on ~~two different measurement data sets: one from~~ the preform measurement and ~~another from~~ the fiber measurement, their respective deviations from their respective predetermined nominal values, and ~~said~~ their respective nominal values, for said optical fiber drawing process control".

6. The final O.A. (p.4) rejected Claims 26-29 and 32-34 for the "term 'bare fiber' is indefinite as to its meaning", especially in paragraph 0003 of the specification.

   However, the sentence regarding "bare fiber" in paragraph 0003 under Section 2 Description of the Related Art is cited from Yoshimura 5073179, col. 1, lines 16-18.

   "Bare fiber" recited in Claims 26-29 and 32-34 is a term of art in US 5073179 (Yoshimura, col. 1, lines 16-18 and 18-26) and US 5443610 and 5551967 (Urruti, col. 1, lines 22, 24, 25; col. 2, lines 24; and abstract), and it is clearly described and shown in all Figures 1-10 of the application as "Bare Fiber 5".

7. Claim 34 has been amended to overcome the rejection on "no antecedent basis for 'the current measurements'" (f. O.A., p.4) as follows:

   "The control method as claimed in Claim 33, wherein the control signals are further based on ~~fluctuation data from the current measurements and~~ historical measurement ~~history~~ data of the preform and the bare fiber being drawn over a period" to overcome the rejection regarding no antecedent basis for "the current measurements".

II. Brief Summary of the References and Differences of the Present Invention

Before discussing the claims and the references regarding 35 USC 102 and 103, applicant will first discuss the references, especially two new cited references Yoshimura 5073179 and Yamamura 6220057, and the general novelty and unobviousness of the present invention over the references by a brief summary as follows:

The Present Invention for the optical fiber drawing process has the general novelty including:

(a) measuring the outer diameter or shape of a *preform*;

(b) measuring the outer diameter of a *bare* optical fiber at *two* different locations before coating, i.e., between the heating and the coating;

(c) generating *two* different *bare* fiber diameter measurement *sets* from these two different measurement locations;

(d) a preform feeding speed control using the measured preform dynamic diameter or shape;

(e) a fiber drawing speed control utilizing the measured preform dynamic diameter or shape;

(f) a tension control utilizing the measured preform dynamic diameter or shape;

(g) the preform feeding speed control utilizing the measured two different bare fiber diameter data sets from the two different locations;

(h) the fiber drawing speed control utilizing the measured two different bare fiber diameter data sets from the two different locations;

(i) the tension control utilizing the measured two different bare fiber diameter data sets from the two different locations;

(j) measuring the outer diameter of a bare fiber at a location at which the *shrinkage* of the bare fiber while stretched is *not larger than a predetermined allowable bare fiber diameter deviation value* of said optical fiber, *or immediately before* the *coating*, to make a final bare fiber diameter measurement;

(k) *a new robust control method and operation principle* using measured preform outer diameter ($D+\Delta D$), its deviation (ΔD) form a predetermined nominal value (D), and this nominal value (D), as revealed in the specification of the present invention, especially in algorithm (3) (page 17, paragraph 0067) and paragraph 0044 (pp. 10-11), to maintain a robust fiber drawing process control against the deviations and variations of the preform diameters and shapes, disturbances, environment and process parameters changes, and to

make a robust performance control of the final bare fiber outer diameter.

Yoshimura (JP) US 5,073,179 teaches optical fiber manufacture in which only one fiber diameter monitor 3 measures the bare fiber diameter, and the shrinkage of the outer diameter of the optical fiber at the monitoring location, while stretched, is not larger than 0.5%, drawing speed is controlled based on the deviation of the measured diameter at position 3 from a preselected outer diameter, and **"as a whole, limiting such factors", including preform diameter change**, that is clearly stated in col. 3, lines 31-38.

Yoshimura has only one measurement in his process, i.e., one measurement of the bare fiber. He does not measure the bare fiber twice at two different locations simultaneously. He teaches (col. 5, lines 32-36, col. 6, lines 1-2) "In the embodiment as shown in FIG. 3, when the [preset stable] drawing rate is small, detection of the outer diameter is carried out with the measuring device 31 and when the rate is increased, the detection is carried out with the measuring device 32. Alternatively, **only one measuring device is used** which can move along the optical fiber depending on the drawing rate". Devices 31 and 32 are selected by a switch in his Fig.3. The position of measuring device 3 is preset, depending on nominal drawing speed.

It is clear that Yoshimura has no motivation and no suggestion to take twice measurements on the bare fiber simultaneously and one measurement on the preform.

Yoshimura's optical fiber drawing method has no above substantial physical features (a)-(k) of the applicant's present invention.

Urruti (US) US 5,551,967 teaches a method for controlling fiber diameter, in which one bare fiber measurement and one coated fiber measurement are made and combined into an overall control signal. Here, only one measurement 52 is made on the bare fiber diameter before hermetic coater 54 and protective coater 56. His bare fiber measurement is as the same as Harding's one measurement of the bare fiber. His new second measurement 60 is of the coated fiber diameter between coater 54 and coater 56. "Since the fiber has been hermetically-coated at this point, the technique used for this measurement must be operable in the presence of such a coating", as stated. This technique has many disadvantages and is more complex than a bare fiber diameter measurement technique.

Urruti 5443610 discloses the same as cited discussed in the applicant's specification (p.6, para. 0023; p.18, para. 0074; p.21, para. 0089). Urruti 5551967 is a division patent of US 5443610.

It is clear that Urriti has only one measurement of the bare fiber. Urruti is lack of the above substantial physical features (a)-(k) of the applicant's present invention.

It is clear that Urruti has no motivation and no suggestion to take twice measurements on the bare fiber simultaneously and one measurement on the preform.

Yamamura (JP) US 6,220,057 teaches a method to manufacture a **glass ingot**, at best it relates to preform, but not fiber. His process is with outer diameter measurements above and below the heating, but both **in the furnace**. The measurement 6a in the furnace above the heating controls the furnace temperature distribution within the heating furnace when "a variation of a measurement of the outer diameter measuring device 6a exceeds a preset value". The measurement 6b in the furnace below the heating is for a relative glass ingot stretch control.

It is a different process with different scope and content. Yamamura clearly does not teach a step of measuring the outer diameter of final glass ingot, at best a preform, after inevitable shrinkage in his process. So, no measurement is after and outer the furnace. His last measurement 6b of glass ingot is in furnace 10 as shown in his Figs. 1 and 5.

Of course, he does not teach the measurement for the fiber drawing process. Thus, Yamamura is obviously lack of the above substantial physical features (a)-(k) of the applicant's present invention of the robust diameter controlled optical fiber drawing process.

Kenmochi (JP) US 6,178,778 teaches a method to manufacture a preform with monitoring the diameter at **two locations in the furnace** for controlling the preform drawing speed. The one for measuring the preform after the heating is only for a check to examples, not for any control in his method. Therefore, it is a different process with different scope and content. Furthermore, it clearly omits the above substantial physical features (a)-(k) of the applicant's present invention.

From the above brief, it is clear that Applicant's invention patentably differs from the prior art on the basis that there is (1) outer diameter measurement of preform prior to entering furnace; (2) double outer diameter measurements of the bare fiber after the furnace and prior to coating; and (3) his novel control principles and methods.

III. Response to the Claim Rejections related to 35 USC §102 or 103

All comments regarding 35 USC 102 and 103 have been taken into consideration in amending partial claims, but without raising any new issues, to overcome the rejections. Applicant respectfully requests reconsideration of these rejections to last claims 21-34, i.e., now claims 21-22, 24-26, 28 and 30-34, for the following reasons.

A. Claims 21-22 and 24-25 Distinguish from and Are Patentable over Yoshimura 5073179 and Yamamura 6220057 or Kenmochi 6178778.

The final O.A. rejected Claims 21-23 as being anticipated by Yoshimura, and Claims 24-25 as being obvious on Yoshimura and Yamamura. However, Claims 21-25 patentably differs from the prior art including Yoshimura and Yamamura, for the following reasons.

A.1. Claim 21 has substantial physical and manipulative feature differences that significantly distinguish from and are patentable over Yoshimura 5073179.

1. ***Yoshimura 5073179 lacks the following substantial manipulative features claimed in Claim 21, as recited as follows:***

   i. "measuring either the outer diameter or shape of a preform";

   ii. "providing a control system with the measured outer diameter or shape of said preform, ... to control said drawing process"; and

   iii. "wherein the control process controls at least one member of the group comprising a feeding speed control of said preform, a drawing speed control of said optical fiber, and a tension control of said optical fiber".

2. **Yoshimura does not anticipate the present invention because of his clear lacking of key features of the present invention as claimed in Claim 21.**

   The final O.A. (p.5) rejected claims 21-23 under 35 USC 102(b) as being clearly anticipated by Yoshimura 5073179. The final O.A. (p.5) states "As to the step of measuring the preform, see col. 4, line 41: Since it is known that the preform had a diameter of 25 mm – it is clear that it was measured."

However, the facts clearly show that Yoshimura does not anticipate the present invention not only because his lacking of key features as claimed in Claim 21, but also because of the facts as described below.

a. What Yoshimura anticipates and teaches is to limit preform diameter change, as Yoshimura 5073179 (col. 3, lines 30-39) clearly stated "the outer diameter of the optical fiber depends on a preform diameter, structural factors of the drawing furnace such as a heating length, a size of the furnace outlet, and a flow rate and a kind of an inert gas. **Thus, the present invention resides in not only limiting** the distance between the outlet or a center of the drawing furnace and the measuring device for the outer diameter **but also, as a whole, limiting such factors described above.**" [emphasis added]

b. What Yoshimura teaches is "The present invention is characterized in that the outer diameter measuring device 3 is located at a position at which the shrinkage of the outer diameter of the optical fiber, while stretched, is not larger than 0.5%, preferably 0.5 to 0.3%. As a result, the position is shifted downward from the conventional position of the measuring device." (Yoshimura 5073179, col. 3, lines 17-23) It is not a preform diameter measurement.

c. Furthermore, the citation of Yoshimura's example at col. 4, lines 37-41, should read "Other conditions were as follows: Outer diameter of preform 25 mm".

   It clearly shows that it is a preset constant preform diameter condition for the process.

   It is not a continuous measuring of the preform diameter in the fiber drawing process. He uses a preset preform diameter of 25mm. He does not teach a measurement on it.

   If Yoshimura's process had continuously measured the preform diameter, he would have listed or described any inevitable preform diameter changes in his example. If Yoshimura's preform was measured as same as the present invention for the process, the outer diameter of Yoshiumura's preform would not be all even 25 mm along the whole preform. It is impossible to have a preform diameter of a constant 25 mm without any deviation from one end to another end of the preform.

   A more important evidence is what he stated in his invention as listed above. His

Figures 1-3 also prove this fact, i.e., his process does not monitor/measure the preform diameter, but uses a preset preform diameter value, such as 25mm.

It is a well known fact that the convention methods do not measure the preform diameter in the fiber drawing process, but may use a preset constant value. (Please also refer to Applicant's last Response regarding Pilkington GB 2238536.)

d. There is no preform diameter monitor (measurement device) described or shown in either Yoshimuro's Specification or Figures.

e. Moreover, Yoshimura has no motivation to monitor the preform diameter in his process because his motivation is "as a whole, limiting such factors described above", including the preform diameter!

f. Furthermore, Yoshimura does not teach any measuring preform and using a preform measurement to control either the preform feeding speed or the fiber drawing speed in his optical fiber drawing process.

3. **Robustness of the process in the present invention is specified in the whereby clause.**

The final O.A. (p.5) comments that "As to the process being 'robust'. The process is deemed to be sufficiently robust enough to make a fiber (or for Yoshimura's purpose, or to desire to get a patent for it.) The claim does not specify the degree of robustness."

Regarding this comment, applicant will recite the whereby clause of Claim 21 as follows:

"whereby said optical fiber drawing process will be robustly controlled with robust performance of said process and robust quality of said optical fiber [[,]] against deviations of the preform outer diameter and shape at different locations and against deviations of various preforms, making a robust diameter-controlled optical fiber".

Thus, it is clear that the robustness as an advantage the present invention claimed is specified as the robust performance of said process and robust quality of said optical fiber *against deviations of the preform outer diameter and shape at different locations* and *against deviations of various preforms*, making a robust diameter-controlled optical fiber. This specific robustness is lacked by the prior art including Yoshimura's process and Urruti's process, because their processes lack the preform diameter monitoring and a dynamic control based on the measured preform diameter data.

Applicant highly honors and respects Yoshimura's invention by moving the bare fiber diameter monitor position downward. It is well known, how to locate measurement monitor location is a challenging problem, especially in a complex process control, such as an optical fiber drawing process.

At the same time, Applicant also respectfully request the PTO to recognize and honor the present invention patentably distinguished from the prior art.

A.2. There is No Any Teaching, Suggestion, or Motivation for Combining or Modifying Features of the References. Therefore, the rejection is as being based on hindsight from the piece of the present invention. However, the present invention does not combine two distinct and separate processes. It is an optical fiber drawing process.

Neither Yamamura nor Kenmochi, of course, nor Yoshimura, nor Urruti has shown any teaching, suggestion, or motivation for combining features of the references. Their teachings do not show any motivation or suggestion for the proposed combination.

Yoshimura and Urruti and Yamamura and Kenmochi Do Not Contain Any Justification to Support Their Combination or Modification, Much Less in the Manner Proposed.

With regard to the proposed combination of Yoshimura and Yamamura, or Urruti and Yamamura, it is well known that in order for any prior-art references themselves to be validly combined for use in a prior-art §103 rejection, the *references themselves* (or some other prior art) must suggest that they be combined, e.g., as was stated in In re Sernaker, 217 USPQ 1,6 (CAFC 1983):

> "[P]rior art references in combination do not make an invention obvious unless something in the prior art references would suggest the advantage to be derived from combining their teachings."

That the suggestion to combine the references should not come from applicant was forcefully stated in Orthopedic Equipment Co. v United States, 217 USPQ 193, 199 (CAFC 1983):

> "It is wrong to use the patent in suit [here the patent application] as a guide through the maze of prior art references, combining the right references in the right way to

achieve the result of the claims in suit [here the claims pending]. Monday morning quarterbacking is quite improper when resolving the question of nonobviousness in a court of law [here the PTO]."

Applicant would further cite the following. As was further stated in Uniroyal, Inc. v. Rudkin-Wiley Corp., 5 USPQ2d 1434 (CAFC 1988),

"[w]here prior-art references require selective combination by the court to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gleaned from the invention itself. ... *Something in the prior art must suggest the desirability and thus the obviousness of making the combination.*" [emphasis added]

In line with these decisions, the Board stated in Ex parte Levengood, 28 USPQ2d 1300 (P.T.O.B.A.&I. 1993):

"In order to establish a *prima facie* case of obviousness, it is necessary for the examiner to present *evidence*, preferably in the form of some teaching, suggestion, incentive or inference in the applied prior art, or in the form of generally available knowledge, that one have ordinary skill in the art *would have been led* to combine the relevant teachings of the applied references in the proposed manner to arrive at the claimed invention. ... That which is within the capabilities of one skilled in the art is not synonymous with obviousness. ... That one can *reconstruct* and / or explain the theoretical mechanism of an invention by means of logic and sound scientific reasoning does not afford the basis for an obviousness conclusion unless that logic and reasoning also supplies sufficient impetus to have led one of ordinary skill in the art to combine the teachings of the references to make the claimed invention. ... Our reviewing courts have often advised the Patent and Trademark Office that it can satisfy the burden of establishing a *prima facie* case of obviousness only by showing some objective teaching in either the prior art, or knowledge generally available to one of ordinary skill in the art, that 'would lead' that individual 'to combine the relevant teachings of the references.'... Accordingly, an examiner cannot establish obviousness by locating references which describe various aspects of a patent applicant's invention without also providing evidence of the motivating force which

would impel one skilled in the art to do what the patent applicant has done."

In the present case, there is no reason given in the final O.A. to support the proposed combination by any teaching, suggestion or motivation in the references or one of an ordinary skill in the art, because Yoshimura clearly teaches and suggests "as a whole, limiting such factors" including preform diameter deviation (Yoshimura, col. 3, lines 38-39), and Yamamura teaches glass ingot manufacturing, but not the fiber drawing process.

In the present case, there is no reason given in the final O.A. to support the proposed combination, other than the statement "for the advantage that Yamamura teaches". However, the fact that the advantage that Yamamura teaches in a glass ingot manufacturing, at best a preform, is not sufficient to gratuitously and selectively substitute parts of one reference (Yamamura's glass ingot manufacturing process library) for a part of another reference, and is not sufficient to gratuitously and selectively add parts of one reference (Yamamura's glass ingot manufacturing process library) into a part of another reference, in order to meet applicant's novel claimed invention.

The final O.A. (p.7 and p.9) noted that the combination of Yoshimura and Yamamura or Urruti and Yamamura produces an advantage "so as to better the controlling" (final O.A., p.9, line -5 from the bottom), even though no teaching, suggestion or motivation for the combination, and even though this combination would destroy their both processes as analyzed below, and even though, assume this combination would work, further modification as suggested would still omit the significant features of the claimed present invention. Applicant submit that the fact that the supposed combination advantage militates in favor of applicant because it proves that the present invention produces new and unexpected results and hence is unobvious, in view of that the present invention not only has that advantage, and but also distinguishes from the proposed unsuitable combination as stated below.

Applicant therefore submits that combining Yoshimura or Urruti and Yamamura or Kenmochi is not legally justified and is therefore improper. Thus applicant submits that the rejection on these references is also improper and should be withdrawn.

Applicant respectfully requests, if the claims are again rejected upon any combination of references, that the Examiner include an explanation, in accordance with MPEP 706.02,

Ex parte Clapp, 227 USPQ 972 (P.T.O.B.A.&I. 1985), and Ex parte Levengood, supra, a "factual basis to support his conclusion that it would have been obvious" to make the combination.

A.3. Claim 21 is Unobvious and Patentable Over Yoshimura 5073179 and Yamamura 6220057 or Kenmochi 6178778.

From the above A.1, it is very clear that the present invention is not identically disclosed or described as set forth in section 102 of 35 USC.

In addition to the above section A.2, this section will further show the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would NOT have been Obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Applicant respectfully requests reconsideration of this rejection for the following reasons:

1. **As stated in A.2, there is no motivation or suggestion to combine or modify the references. Moreover, the references teach away from the modification.**

   Yamamura, Kenmochi and Yoshimura (including Urruti), never teach or suggest combining the glass ingot or preform manufacturing process and the fiber drawing process. Also, they never teach or suggest modifying fiber drawing process as the preform manufacturing process. Moreover, Yoshimura teaches away from the suggested modification. He wants to limit the preform diameter deviation as a condition.

2. ***Different Scope and Content* of the prior art Yamamura and Kenmochi:**

   Yamamura is in different scope and content for manufacturing glass ingot, at best it related to preform, but not for optical fiber drawing process

   His innovation mainly is the control of the temperature distribution within the heating furnace based on his measurement 6a in the furnace above the heating for glass ingot, a different manufacturing process from the fiber drawing process. Therefore, the difference from the present invention is so clear.

Kenmochi is for manufacturing preform. It is still a different manufacturing process from the fiber drawing process. His innovation mainly is to monitor the diameters at two locations *in said heating furnace* to control the rod drawing speed, but not ingot feeding speed (20mm/min). Therefore it is clear that Kenmochi is in different scope and content.

Either Yamamura process or Kenmochi process makes different product from the present invention product.

3. ***Differences between the present invention and Yamamura or Kenmochi*, in addition to the explanation in above A.1.1:**

i. Yamamura clearly does not teach a step of measuring the outer diameter of final glass ingot, at best a preform, after inevitable shrinkage in his process, i.e., no measurement after and outer the furnace. His final measurement 6b is in the furnace.

ii. Kenmochi clearly does not teach a step of measuring the outer diameter of final preform after inevitable shrinkage in his process. His two measurements (67, 68) are in the furnace.

iii. They clearly do not teach a step of providing a control system with the measured outer diameter or shape of said preform after inevitable shrinkage in their process. Also, please see their respective Fig. 1.

Kenmochi uses two measurements in the furnace for preform manufacturing. Device 71 is used only for a comparative example, but not for his method, as a convention method when his measurements 67 and 68 are not used for control.

Furthermore, no prior art teaches a step of measuring the preform diameter in the fiber drawing process and providing the preform measurement to a control system to control the fiber drawing process continuously and dynamically.

iii. The present invention is a new fiber drawing process/method that is totally different from Yamamura's process and Kenmochi's process.

iv. The present invention uses the final preform outer diameter or shape measurement for the fiber drawing process control. However the prior art does not.

v. The present invention fiber drawing process control includes a preform feeding speed

control, a fiber drawing speed control and a fiber tensor control. However, neither Yamamura nor Knemochi do that.

4. **Furthermore, it is a well-known and clear fact that optical fiber manufacturing has two major distinct processes, i.e., the preform manufacturing and the optical fiber drawing. They are totally separated processes and not combined due to a lot of technical difficulties. Please refer to the prior art.**

5. **Moreover, if combined or modified as the final O.A. suggests, their two process control systems would give conflict controls for preform movement, and thus destroy the references and the whole combined process. Thus, it is inoperative and destroys the references.**

   For example, Yamamura's monitor 6b detects an outer diameter large, then "the take-off speed of the drawn rod" should relatively increase in order to maintain the desired rod diameter. However, due to the combination, this "take-off speed of the drawn rod" in the glass ingot process is the preform feeding speed in the fiber drawing process. It means that the preform feeding speed is increased. It destroys Yoshimura's process conditions that are limited. Please refer to below B.3.7 for a case of no limit to the feeding speed.

   Any unavoidable change detected by Yamamura's monitor 6b will destroy Yoshimura's fiber drawing process by the proposed combination.

   Same destroy will happen to the Yoshimura's fiber drawing process by a proposed combination of Yoshimura and Kenmochi, when Kenmochi's monitor 68 detects any change of the outer diameter.

   On the other hand, because Yoshimura's process limits its conditions, it will destroy the glass ingot or preform drawing speed changes in either Yamamura or Kenmochi's process, i.e., the combination destroys both combined reference processes.

   Thus, the proposed combination and modification would be inoperative if it were simultaneously to perform a fiber drawing process from a glass ingot or preform in the Yamamura or Knemochi's process. It destroys the all references.

6. **Even as modified or combined in the manner proposed, the resultant teaching still omits one or more of the significant physical features in Claim 21** as follows:

i. "measuring either the outer diameter or shape of a preform" out the furnace after inevitable shrinkage;

ii. "providing a control system with the measured outer diameter or shape of said preform ... to control said drawing process", i.e., the fiber drawing process;

iii. "wherein the control process controls at least one member of the group comprising: a feeding speed control of said preform, a drawing speed control of said optical fiber, and a tension control of said optical fiber", utilizing the measured outer diameter or shape of said preform, in addition to a predetermined nominal preform value.

Furthermore, the fiber drawing process is a *large stretch* and has dramatic change of its size, totally different from Yamamura glass ingot and Kenmochi preform processes.

7. ***Yoshimura clearly does not teach a step of measuring the diameter of preform in his whole specification, including col. 3, lines 30-34.***

The final O.A. (p.6) comments that "Yoshimura does disclose that the fiber diameter does depend upon the preform diameter (col. 3, lines 30-34)."

However, what Yoshimura teaches is clearly as what he states in col. 3, lines 30-39:

> "the outer diameter of the optical fiber depends on a preform diameter, structural factors of the drawing furnace such as a heating length, a size of the furnace outlet, and a flow rate and a kind of an inert gas. **Thus, the present invention resides in** not only limiting the distance between the outlet or a center of the drawing furnace and the measuring device for the outer diameter **but also, as a whole, limiting such factors described above**". [emphasis added]

It is *to limit such these factors including the preform diameter changes/deviations.*

Therefore, *Yoshimura does not teach measurement of the outer diameter of the preform to dynamically control the fiber drawing process. The prior art uses a predetermined diameter of the preform in the fiber drawing process.*

From Yoshimura, col. 3, lines 30-39, his teaching is totally different from the present invention. His motivation and control principle are to limit the preform diameter deviation, totally different from the present invention. It is entirely unobvious to measure

the preform outer diameter continuously for fiber drawing control in the prior art.

8. Yamamura clearly does not teach a step of measuring the outer diameter of final glass ingot after inevitable shrinkage in his process. His last measurement 6b of ingot is in furnace 10 as shown in his Figs. 1 and 5.

The final O.A. (p.7) states "Yamamura is cited as showing that one can monitor the preform diameter so as to better the controlling when the diameter of the preform exceeds the preset value (i.e. nominal value). See Yamamura, col. 1, lines 30-53 and col. 2, lines 64-67. It would have been obvious to monitor the Yoshimura preform diameter in the manner taught by Yamamura, for the advantage that Yamamura teaches, and because Yoshimura suggests that preform diameter is a relevant factor during the drawing of glass performs."

However, in view of the above items in A.1 – A.3, it is clear that the above statement is incorrect. A group of summarized reasons are listed below.

i. There is no motivation to combine them, because Yoshimura clearly teaches to limit the factors change.

ii. The combination will destroy the both processes.

iii. Even as modified or combined, the resultant teaching still omits the significant features as listed above.

iv. Therefore, the present invention is unobvious.

v. Here, in addition to the above list, more facts and analysis are provided to show unobviousness as follows:

In Yamamura, col. 1, lines 30-53 first describe problems in the glass ingot drawing process, and then give an object of his invention. His col. 2, lines 64-67 and col. 3, lines 1-3 recite that "On the other hand, when the tapered portion of the ingot is drawn in case where a variation of a measurement of the outer diameter measuring device 6a exceeds a preset value, the heaters of the heating means 1a to 1c are controlled in their output power so that the temperature distribution is in the state shown in (b) of FIG. 2b."

Thus, the following facts are clear:

a. "a variation of a measurement of the outer diameter measuring device 6a exceeds a preset value" is *not for the preform of the fiber*, but for glass ingot before the heating and monitored by 6a in the furnace.

b. Yamamura's product, at best a preform, is after the heating and drawing, and its product diameter is not the measurement of 6a before the heating.

c. What Yamamura controls based on measurement 6a in the furnace, when it "exceeds the preset value (i.e., nominal value)", is the *temperature distribution in the furnace. That is in the manner taught by Yamamura, for the advantage that Yamamura teaches*, even though it is in different scope and for different product.

d. On the other hand, what Yoshimura clearly suggests is to *limit the preform diameter changes*, not a method to monitor it.

e. The suggested modification still omits the key features of Claim 21 as listed above.

f. Thus, it is very clear that even modified as final O.A. suggests, "to monitor Yoshimura preform diameter in the manner taught by Yamamura" would not lead to applicant's invention as claimed. Of course, the modified resultant teaching still can not reach the principles and methods of the present invention.

9. **It is clear from the above that Yamamura's new measurement within a furnace above heating is used for controlling the heating furnace temperature distribution when "a measurement of the outer diameter measuring device 6a exceeds a preset value". Further, this measurement is not a preform measurement. Furthermore, his both measurements are within furnace 10. All these are totally different from the present invention as described in the specification and claimed in the claims.**

10. **Moreover, only through hindsight would someone find and combine them with an inoperative combination, because the combined or modified references are from different arts and different scopes, and will destroy each other process if combined.**

11. **The combination would not be robust because the suggested combination would be inoperative and destroy both processes. Robustness of the present invention is specific in the whereby clause of the claims.**

The final O.A. (p.7) states that "Again, it is deemed that the *combination* would be

sufficiently robust to be able to produce a useable fiber. The claims do not specify how robust the performance would be." [emphasis added]

As listed in above A.3.5, the suggested combination will destroy the both references processes. Therefore, the combination would be sufficiently unstable and not robust. The combination would not produce a useable fiber because of the conflict control in the combination of the references.

As listed in A.3.6, even if the suggested combination were performed, this assumed combination would still omit the key features of the present invention in Claim 21.

Regarding the specific robustness of the performance, please refer to above A.1.3. It is stated in Claim 21 as "robust performance of said process and robust quality of said optical fiber against deviations of the preform outer diameter and shape at different locations and against deviations of various preforms, making a robust diameter-controlled optical fiber". It is one of new important results form the present invention.

Therefore, from the above items in A.2 and A.3, Claim21 is definitely unobvious as a whole at the time this invention was made to an ordinary skill person in the art.

A.4. Dependent Claims 22 and 24-25 Are Unobvious and Patentable Over Yoshimura 5073179 and Yamamura 6220057 or Kenmochi 6178778.

Dependent claims 22 and 24-25 incorporate all the subject matter of claim 21 and add additional subject matter which makes them a fortiori and independently patentable over Yoshimura and Yamamura or Kenmochi.

1. Claim 22 additionally recites:

"measurement of said preform outer diameter or shape is on-line as a preferred method;

the measured diameter or shape is on-line real-time fed to said control system; and

said control system generates a control signal based on the measured preform diameter or shape , its deviation from the predetermined nominal preform value, and said nominal preform value,

for controlling said process in face of the deviations of the preform diameters or

shape."

It is clear that even as modified or combined, the resultant teaching still omits one or more of applicant's claimed features in Claim 22, such as said "control system generates a control signal based on the measured preform diameter or shape , its deviation from the predetermined nominal preform value, and said nominal preform value".

2. **The references lack key feature steps in the claims.**

The final O.A. (p.7) states "The generating of control signals is clearly met."

The above statement is not true from the above citation, because the important key features include how to generating signals, i.e., what to be based on for generating control signals, and what to be controlled and how to control by the generated signals.

Yoshimura omits the measurement of the preform, and, of course, lacks generation of the control signal based on this measurement.

As described above, Yamamura clearly lacks a step of measuring the outer diameter of final ingot after inevitable shrinkage in his process. His last measurement of ingot is in furnace 10 as shown in his Figs. 1 and 5. His process lacks the feature claimed in applicant's Claim 22.

Neither Yoshimura nor Yamamura does generate a control signal based on the measured preform diameter or shape, its deviation from the predetermined nominal preform value, and said nominal preform value. Also, neither Urruti nor Kenmochi does that.

Yamamura is also clearly for different scope and different product.

3. **Claim 24 additionally recites:**

"generating control signals based on the preform measurement and the fiber measurement, their respective deviations from their respective predetermined nominal values, and their respective nominal values, for said optical fiber drawing process control".

The above citation is a novel control principle and patentably differs from the prior art.

4. **Claim 25 additionally recites:**

"wherein the position of measuring the optical fiber is at a position at which

shrinkage of the outer diameter of said optical fiber is not larger than a predetermined allowable diameter deviation value of said optical fiber;

said control system generates control signals to control the drawing speed of said fiber from the melting preform and the feeding speed of said preform into the furnace, based on the measured preform outer diameter or shape , its deviation from the predetermined nominal preform value, said nominal preform value, the measured optical fiber outer diameter, its deviation from the predetermined nominal fiber value, and said nominal fiber value; and

the drawing process being carried out at said drawing speed and said feeding speed."

The above novel control principle in Claim 25 is entirely foreign to the prior art.

5. **The term "predetermined allowable bare fiber diameter deviation value" is a calculated and represents a significant limitation.**

The final O.A. (p.7) comments on Claim 25 that "But for the specific location, it is deemed that this limitation does not significantly limit the claim – it does not impart any manipulative difference to the claim. The broadest reasonable interpretation of 'predetermined allowable diameter deviation value' encompasses a value that the artisan has in his mind. The claim does not require a step of determining that value, or using that value in any way. Thus, 150% would be a predetermine value of which the Yoshimura shrinkage would not be larger then."

However, the above final O.A. comment is clearly incorrect.

The term "predetermined allowable bare fiber diameter deviation value" is a calculated and represents a significant limitation. It is a limitation for the fiber drawing process as stated in the preamble. It is described in the Specification, paragraph 0048. Thus, it can not be imaged that 150% would be a predetermined allowable diameter deviation value of the bare fiber measurement for the fiber drawing process.

Regarding the term "predetermined allowable diameter deviation value", please also refer to Record of the Substance of the Interview of 8-30-2004, page 6, XII. Item 5. It is from the product specification and/or requirement, and is predetermined.

6. **One important key is the novel control principle for the feeding speed control in the**

claims. It is entirely foreign to the prior art. The references lack that.

The final O.A. (p.7) states "The rest of the limitations are clearly met (or discussed above in the discussion of claim 24) – except for the control of the feeding speed. IT would have been obvious to control the feeding speed – because if it was randomized, it might feed it too quickly or slowly. Furthermore, it would have been obvious that the feed speed would have to be determined – somehow – either manually or automatically. ... Presently the claims do not require any specific control."

However, here the key is what the control principle for the feeding speed control is, as what the feeding speed control is based on.

Yoshimura does not teach any about preform feeding speed or rate. But he teaches limiting conditions, just including preform diameter and feeding speed.

However, the present invention as claimed utilizes the feeding speed change, i.e., adjusts/controls the feeding speed "based on the measured preform outer diameter or shape, its deviation from the predetermined nominal preform value, said nominal preform value, the measured optical fiber outer diameter, its deviation from the predetermined nominal fiber value, and said nominal fiber value", as clearly recited in Claim 25.

The claims do require and recite a specific control based on the following specific factors: "the measured preform outer diameter or shape, its deviation from the predetermined nominal preform value, said nominal preform value, the measured optical fiber outer diameter, its deviation from the predetermined nominal fiber value, and said nominal fiber value". **That recites clear and specific limitations to a specific control and algorithm that patentably differ from the prior art, because of not only deviation or measurement.**

The feeding speed control in Claim 25 is unobvious over the prior art.

7. Errors in the final O.A. for the fiber drawing process control.

The final O.A. (p.8) states that "Alternatively: it is well understood that if one is controlling the output of a process, one has to control the input to a process. If one increase the rate of drawing fiber – one would expect a corresponding change in the rate of input material. For example one cannot feed 1.0 kg/hr of preform into a furnace and

expect to withdraw 1.1 kg/hr of fiber nor withdraw 0.9 kg/hr. One can only withdraw exactly 1.0 kg/hr. It would have been obvious to control the feed rate to balance the input and output."

The above statement is incorrect and has errors as described as follows.

i. In many controlled processes, the input of a process is the reference command/signal.

a) In a car cruise speed control process, the input is a preset speed, and the output is the car speed. Then, if one is controlling the output of a process, i.e., his car speed to reach his desired preset speed, he does not have to adjust/control the input of the process, i.e., the preset speed command when a car is up or down hills and suffers its output speed changes.

b) In the fiber drawing process, the input of a process includes "PRESET DIAMETER" and "PRESET DRAWING RATE" in Yoshimura Fig. 2, "SPEED TARGET" and "DIAM. TARGET" in Urruti Fig. 5. The reference signal is preset or predetermined. When Yoshimura controls the output of his process as his control purpose, i.e, the bare fiber diameter, he would not have to change/control his "preset diameter" and "preset drawing rate" of the input of the process, as he teaches.

ii. Thus, the above control concept stated in the final O.A. (p.8) is incorrect or not valid for any processes.

iii. The example in the final O.A. is only valid for a certain period of time and a stable process without any mass changes to the optical fiber from heating, dusts, contaminants, such as microscopic particulate matter, and others during the process. It may not be valid for a dynamic process at dynamic instant.

iv. Automatic control is not simple, especially for complex process control, such as optical fiber drawing process control. The key issues are what is to be controlled (e.g., weight or diameter), what measurement system is (e.g., locations, technique ...), what actuator system is, what it controls (e.g., feeding speed or drawing speed or furnace temperature distribution), how to control (e.g., static, dynamical, robust ...), what control principle is (e.g., based on what, deviation only, or others), and so on.

v. In the prior art, the feeding speed control does not depend on the preform diameter

deviation because the prior art has no preform monitor in the optical fiber drawing process. Therefore when the preform diameter changes, the feeding speed has no any corresponding adjustment to the dynamic changes of the preform diameter.

vi. The above facts and analysis have further shown that the present invention as a whole is unobvious over the prior art and unobvious at the time the invention was made to a person having ordinary skill in the art, as stated in 35 USC 103(a).

The above final O.A. errors further prove that the present invention is unobvious.

8. **The novel control principle in the present invention is entirely foreign to Yoshimura, Urruti, Yamamura and Kenmochi, since the reference process and "control system" do not have a control based on the measured perform diameter or shape, its deviation from a predetermined nominal value, and said nominal value, as claimed in Claims 22 and 24-25** and as discussed in above item 6.

From the above A.2 – A.4, the present invention as claimed by claims 22 and 24-25 is unobvious.

B. Claims 26 and 28 Distinguish from and Are Patentable over Urruti 5551967 and Yamamura 6220057 or Kenmochi 6178778.

The final O.A. (pp. 5, 8-9) rejected Claim 26 as being anticipated on Urruti, and Claim 28 as being obvious on Urruti and Yamamura. However, Claims 26 and 28 patentably differs from the prior art including Urruti, Yamamura and Kenmochi as described in II, III.A.2 and below.

Applicant respectfully requests reconsideration for the following reasons.

B.1. Claim 26 has substantial physical and manipulative features that significantly distinguish from and are patentable over Urruti.

1. ***Urruti 5551967 lacks the following features of Claim 26, as recited as follows:***

i. "measuring the outer diameters of said optical fiber, which is bare before coating, at two or more different locations";

ii. "at this second position shrinkage of the outer diameter of said optical fiber, while

stretched under the drawing, is not larger than a predetermined allowable bare fiber diameter deviation value of said optical fiber, or immediately before the coating";

iii. "producing different measurement data sets of the bare fiber respectively from the different locations";

iv. "providing a control system with the different measurement data sets";

v. "wherein said control system ...
calculates the deviations of the two bare fiber measurement data sets from their respective preselected values, and
dynamically controls a fiber drawing speed and a preform feeding speed for the drawing process based on the deviations of the two bare fiber measurement data sets from their respective preselected values".

2. Urruti does not anticipate the present invention because of his lacking of key features of Claim 26 such as listed above.

The final O.A. (p.5) rejects Claim 26 as being anticipated by Urruti. The final O.A. (pp.5-6) comments that "See figure 5, col. 2, lines 19-31, and col. 4, lines 32-65 and col. 5, lines 8-20. As to the bare fiber being measured at two locations: this limitation is met as per the definition used by applicant on page 5 (paragraph 0003) of the specification. At both locations the fiber has "just left" the furnace – for example within one to 5 minutes time. And at both locations the fiber is "intact" because it remain uninjured."

However, from above B.1.1, it is clear that Urruti lacks the above listed key features in Claim 26. Therefore, it is clear that the claimed features are not anticipated by Urruti.

Urruti Fig. 5 clearly does not show any second bare fiber measurement. Furthermore, his Fig. 5 does clearly show a "SHADOW GAUGE 101" for his second measurement on a coated fiber, but not a bare fiber.

The sentence regarding "bare fiber" with words "just left' and "intact" in paragraph 0003 under Section 2 Description of the Related Art is cited from Yoshimura 5073179, col. 1, lines 16-18.

"Bare fiber" recited in Claims 26, 28 and 32-34 is a term of art in US 5073179 (Yoshimura, col. 1, lines 16-18 and 18-26) and US 5443610 and 5551967 (Urruti, col. 1,

lines 22, 24, 25; col. 2, lines 24; and abstract), and it is clearly described and shown in all Figures 1-10 of the application as "Bare Fiber 5".

Urruti, col. 2, lines 19-31 address his problem analysis as in lines 28-31 "This would not be a problem if there were a constant relationship between the diameter at the point of measurement and the final diameter. Unfortunately, this is not the case."

His col. 4, lines 32-65 clearly address that his second measurement is on the coated fiber. In these lines, he clearly states the advantage of IDM measurement technique for the bare fiber measurement. But it can not be used for the coated fiber measurement. His col. 4, lines 60-67 are cited as follows: "**The second diameter measurement is made between hermetic coater 54 and protective coater 56**. With reference to FIG. 1, this measurement can be made either before or after hermetic coating monitor 64. **Since the fiber has been hermetically-coated at this point, the technique used for this measurement must be operable in the presence of such a coating.** One suitable approach is the **shadow technique** employed in the commercial Anritsu monitor." [emphasis added]

His col. 5, lines 1-20 clearly show that even though the hermetic coating is thin, a special measurement technique shadow gauge (Anritsu device) had to be used, and that technique quality of accuracy and speed is lower than IDM technique used for the bare fiber measurement (col. 4, lines 44-59).

His col. 3, lines 58-64 clear state "In the preferred embodiments of the invention, the first signal is produced by an IDM so as to provide high speed, sub-second data suitable for performing statistical calculations to ensure fiber quality as well as to provide information regarding defects in the fiber, and the second signal is produced by a non-IDM diameter measuring device such as one employing a fiber shadow technique."

It is clear that what Urruti anticipates is what he teaches as cited as above.

It is clear that Urruti has not taught and has no motivation of measuring the bare fiber twice. He does not anticipate claim 26. Otherwise, he would not have to use a special monitor technique – shadow technique, rather than an interference technique, with clear disadvantage for his second measurement on a hermetic coated fiber, but not a bare fiber.

3. **Urruti does not anticipate the present invention claimed in Claim 26, otherwise, he would not have taught that** "The second diameter measurement is made between hermetic coater 54 and protective coater 56" and "Since the fiber has been hermetically-coated at this point, the technique used for this measurement must be operable in the presence of such a coating" in col. 4, lines 60-66, US 5551967.

4. **Coated fiber with the carbon is not a "finished bare fiber" before the coating step, because it is not a bare fiber and because it is not before the coating step.**

   The final O.A. (p.6) also comments that "Alternatively, it is deemed that the carbon on the fiber is merely a finish applied to the fiber. And that such results in the 'finished bare fiber'. See page 11, paragraph 0032 where applicant discusses the 'finished bare fiber'."

   In paragraph 0032, applicant states "Furthermore, it should be noticed that no convention method intends to monitor a finished bare fiber diameter which is really an important specification, e.g., 125μm, *before the coating step.*"

   It is clear that "finished bare fiber" is first a "bare fiber" from the words, and it is "before the coating step" as stated in paragraph 0032. "Bare fiber" is well used in the prior art.

   Therefore, the coated fiber with the carbon or other material is not a bare fiber, and, of course, not a "finished bare fiber".

   Whatever how thin the coated material is, its optical characteristics is different from the optical fiber itself. That makes Urruti have to take different technique for measuring his hermetically-coated fiber, that "must be operable in the presence of such a coating" even though with disadvantages. It does not matter how thin the coating is.

   Urruti also never states or claims his second measurement on bare fiber. It further shows that the present invention as claimed in claim 26 patentably distinguishes over Urruti.

B.2. Claim 26 is Unobvious and Patentable Over Urruti 5551967.

1. **Claim 26 Patentably Differs From Urruti on the basis that there is (1) double outer diameter measurements of the bare fiber after the furnace and prior to coating; and (2) novel control principle using two different measurement data sets of the bare fiber by IDM technique and high accuracy to control the fiber drawing process.**

2. **The Proposed Modification on Urruti by Omitting the Hermetic Coating Destroys the Purpose of Urruti's Invention and Damages the Product Quality of Optical Fiber.**

This function is Desired and Required, thus hermetic coating can not be omitted in Urruti 5551967. It further shows that the present invention claimed in Claim 26 is unobvious and patentable.

The final O.A. (p.8) comments that "Urruti recognizes the same thing that Applicant does: that at high speeds, the fiber is not completely formed when it leaves the furnace (Col. 2, lines 23-31 and col. 5, lines 8-20). It is clear that this would happen even if there was no hermetic layer applied. It would have been obvious to omit the hermetic coater if no hermetic coating was needed/desired." Further, the final O.A. cites MPEP 2144.04, II. ELIMINATION OF A STEP OR AN ELEMENT AND ITS FUNCTION.

However, the hermetic coating is a required function that can not be omitted from Urruti 5551967. Otherwise it would destroy the reference purpose and damage the fiber quality.

The hermetic coating is required "to reduce absorption of water and hydrogen into fiber" (Urruti, col. 1, lines 39-40) for protecting the optical fiber from moisture. It is known that if this coating is omitted, it will cause a detrimental phenomenon called stress corrosion, i.e., static fatigue, and further cause bonds to break down and spontaneous fractures. The fact is that water, hydrogen and moisture is around us in the Nature, and fiber needs this coating that is a key step and can not be omitted in Urruti process.

Furthermore, there is no any teaching, suggestion, or motivation for omitting the hermetic coating in Urruti process. Thus, the rejection to Claim 26 is as being hindsight to build a new process with some key features as claimed in the present invention by omitting some required step and function, but at the same time to destroy the reference purpose and to damage the product quality.

Especially, Urruti teaches using a special shadow technique for monitoring this hermetically coated fiber as that "Since the fiber has been hermetically-coated at this point, the technique used for this measurement must be operable in the presence of such a coating. One suitable approach is the shadow technique employed in the commercial

Anritsu monitor." (col. 4, lines 63-67)

If this function were not desired and could be omitted, then Urruti would not have taught Anritsu device with the shadow technique, where "a tuning-fork is used to sweep a thin beam of light across the width of the fiber and the presence or absence of light at a detector as a function of time is used to locate the edges of the fiber's shadow" (col. 5, lines 4-7), and he would have used "IDM so as to provide high speed, sub-second data suitable for performing statistical calculations to ensure fiber quality as well as to provide information regarding defects in the fiber", (col. 3, lines 59-62) in Urruti 5551967. But he had to sacrifice the advantage of IDM and to use the shadow technique because the hermetic coating is required and can not be omitted.

On the other hand, the present invention also does not propose to omit any Urruti 5551967 coating steps or functions.

Therefore, in all, there is no any basis for citing "Omission of an Element and its Function is Obvious if the Function of the Element is Not Desired" in view of Urriti.

Moreover, even as modified to omit the hermetic coating as the final O.A. suggested, the measurement technique for the second bare fiber measurement in the present invention is totally different from the shadow technique which Urruti uses. The regular bare fiber measurement technique in the present invention has advantage as Urruti recognized and cited above. This fact also shows that the present invention is unobvious over Urruti.

The disadvantages of the shadow technique and the advantage of IDM technique were clearly stated in Urruti 5551967 (col. 2, lines 46-54) as follows:

> "By averaging a series of measurements, the *shadow technique* can provide diameter measurements of good accuracy. The average, however, needs to be made over a period of time on the order of a second which makes *this technique unsuitable for the high speed diameter measurements needed for process control. IDMs, on the other hand, are capable of providing high speed and high accuracy.* Also, they can be used *to detect fiber defects, a capability not shared by shadow measuring techniques.*"

Also, please refer to the above item B.1.2. The fact is clear that Claim 26 is unobvious.

3. Claim 26 provides a distinguished patentable subject matter – a new solution

method to a long-felt and long existing problem and a still unsolved need.

Yoshimura (1991) first addressed a problem that at high drawing rate, the measured diameter by a device located immediately below the furnace is extremely larger than the outer diameter of the finished optical fiber (col. 1, lines52-68). Regarding this problem, Yoshimura (1991) provides his patented solution by moving the measurement location of the bare fiber downwards. Yoshimura has only one measurement in his process, i.e., only one measurement of the bare fiber. He does not measure the bare fiber at two different locations simultaneously. The position of this only measurement is preset, depending on nominal drawing speed.

Urruti (1996) provides his solution to add a second measurement after a hermetic coating by using a shadow technique. Urruti also has only one measurement of the bare fiber.

Applicant (2000) provides his solution to measure the bare fiber twice at two different positions before coating and to control the process by utilizing these two bare fiber measurement data sets. His claim 26 recites these steps as listed in above B.1.1. Urruti lacks the major steps as claimed in Claim 26 of the present invention.

It is clear that applicant proposes his different solution method with many distinguished significant physical features and advantages patentable over Yoshimura and Urruti.

If Claim 26 is rejected because Urruti recognizes the same problem related to Claim 26, how to explain Urruti 5551967 (1996) is issued after Yoshimura 5073179 (1991) had recognized this same problem and proposed his solution?

It is important to recognize different new solution methods for a long-felt and long existing problem. It is important to recognize the important difference and important issues in measuring area and control area.

Applicant highly honors these inventions including Yoshimura and Urruti for the fiber drawing process, and also requests the PTO to recognize the present invention patentable.

4. Urruti Lacks the Claimed Key Physical Features in Claim 26 as listed in B.1.1.

The final O.A. (p.9) comments that "Claim 27: Figure 5 [Urruti] shows the two target diameters. The controller box with 'glass feed' represents the feeding speed control."

Because the features of Claim 27 have been moved to Claim 26, the above comment is now applicable to Claim 26.

The two target diameters in Urruti Fig. 5 are a target fiber diameter and a second target diameter value for a coated fiber measurement measured by shadow gauge 101 (col. 5, lines 29-41), as clearly shown in Fig. 5. Therefore, the difference between Urruti's method and the present invention method claimed in Claim 26 is very clear.

Regarding to the feeding speed control, the key is what the feeding speed control is based on. Urruti Fig. 5 clearly shows that his feeding speed control is based on his one IDM measurement on a bare fiber and one Shadow Gauge measurement on a coated fiber. However, Claim 26 recites the present invention "dynamically controls a fiber drawing speed and a preform feeding speed for the drawing process *based on the deviations of the* ***two bare fiber measurement data sets*** *from their respective preselected values*".

5. **The Claimed Present Invention is Not Obvious and the Prior Art has No Motivation to Take More Than One Measurement on a Bare Fiber**.

   Otherwise, Yoshimura or Urruti would have taught or suggested some modification to build a method as claimed in Claim 26 of the present invention in view of their knowledge of the problem and their solution methods.

6. **The prior art never recognized or taught twice measurements on the bare fiber as a good solution method to the problem in the fiber drawing process; thus the proposed modification is through hindsight in view of the present invention; and thus the present invention as a whole is Unobvious.**

   The novel features in claim 26 solve the problem to reduce the measurement time lag and lead, and to increase the measurement accuracy of the final bare fiber outer diameter. Therefore, the controlled process can be robustly stable and have robust performance by having twice bare fiber diameter measurements to control the bare fiber diameter.

7. **The new twice bare fiber measurements produce new, useful and unexpected results of providing full high speed, high accuracy measurement data, defect detection needed for the high quality fiber drawing process control, especially when the drawing speed is faster and faster and the preform size is larger and larger. These**

unexpected results are an important and significant advantage over Urruti 5551967 (col. 2, lines 48-54). Thus, these facts and new unexpected results further prove that the present invention as claimed in Claim 26 is Unobvious.

Urruti had to use Shadow gauge for his second measurement on a coated fiber. In order to measure a coated fiber with a good accuracy, this technique requires "averaging a series of measurements. The average, however, needs to be made over a period of time on the order of a second which makes this technique unsuitable for the high speed diameter measurements needed for process control" as Urruti recognized (col. 2, 46-51). From Urruti Figs. 2 and 4, it can be observed that his drawing speed is around 8.5~9.9 m/s (1995), and a second delay would damage about 9m fiber quality. A high speed and high accuracy measurement is urgent and critical for a higher speed fiber drawing process.

At the same time, applicant will further point out that his new useful and unobvious method as claimed in Claim 26 produces many advantages, e.g., providing high speed, high accuracy data of the second measurement needed for process control and defect detection, ability to using popular measurement technique over Urruti (refer to Urruti 5551967 Abstract). *This also proves that the present invention method claimed in Claim 26 produces new and unexpected good results and hence is unobvious.*

Applicant submits that the fact that the present invention in claim 26 is (a) **novel**, and (b) produces valuable **new, useful, and unexpected results** proves that it is **unobvious**.

B.3. Dependant Claim 28 is Unobvious and Fortiori Patentable Over Urruti 5551967 and Yamamura 6220057 or Kenmochi 6178778

1. There is No Any Teaching, Suggestion, or Motivation for Combining or Modifying Features of the References.

Urruti and Yamamura and Kenmochi Do Not Contain Any Justification to Support Their Combination or Modification, Much Less in the Manner Proposed.

Therefore, the rejection is as being based on hindsight from the piece of the present invention. On the other hand, the present invention does not combine two distinct and separate processes of preform manufacturing process and fiber drawing process. It is an optical fiber drawing process. Please refer to A.2 (page 20-23).

2. **Claim 28 additionally recites:**

   "a measurement of the outer diameter of said preform above the heating and melting; providing said control system with the measured outer diameter of said preform; wherein the control of the preform feeding speed and the fiber drawing speed of said drawing process is further based on the measured preform outer diameter, its deviation from a preselected nominal preform diameter, and said nominal preform diameter, in addition to the different measurement data sets of the bare fiber."

   That is entirely foreign to Urruti, Yamamura and Kenmochi, or any combination.

3. **Dependent Claim 28 incorporates all the subject matter of Claim 26 and adds additional subject matter which makes it a fortiori and patentable over Urruti.**

4. ***Different Scope and Content* of the prior art Yamamura and Kenmochi (please refer to A.3.2)**

5. **Significant differences between Claim 28 and Yamamura or Kenmochi as listed in above B.3.2 and B.1.1, and please refer to B.3.1 and B.3.4.**

6. **It is a well-known and clear fact that fiber manufacturing has two major distinct processes, i.e., the preform manufacturing and the optical fiber drawing. They are totally separated processes and not combined due to a lot of technical difficulties.** Please refer to the prior art.

7. **Moreover, if combined or modified as the final O.A. suggests, their two process control systems would give conflict controls for preform movement, and thus destroy the references and the whole combined processes.**

   For example, Yamamura's monitor 6b detects an outer diameter large, then "the take-off speed of the drawn rod" should relatively increase in order to maintain the desired rod diameter. However, due to the combination, this take-off speed of the drawn rod in glass ingot process is the preform feeding speed in the fiber drawing process. It means the preform feeding speed is increased. The preform feeding speed increase makes the fiber diameter increase in Urruti's drawing process. Then, Urruti's process control system controller in Fig. 5 commands the preform feeding speed to slow down, just the opposite of what Yamamura's process commands. The conflict commands destroy both Urruti's

process and Yamamura's process. Similar conflict will also happen when monitor 6b detects an outer diameter small. Similarly, when Urruti process control needs the feeding speed to fast, it makes Yamamura's glass ingot take-off speed fast and its ingot diameter smaller, then the signals from Yamamura's outer diameter measuring device 6b will change the take-off speed to slow, just the opposite of what Urruti's process needs. These conflict commands again destroy both Urruti's process and Yamamura's process.

Any inevitable changes detected by Yamamura's monitor 6b or Urruti's monitors will lead to destroy both Urruti and Yamamura processes by the proposed combination.

Similar destroying acts will happen to both Urruti and Kenmochi's processes by the proposed combination of their processes, when Kenmochi's monitor 68 detects any change of the outer diameter, or Urruti process commands any feeding speed change.

Thus, the proposed combination and modification would be inoperative if it were simultaneously to perform a fiber drawing process from a glass ingot or preform in the Yamamura or Knemochi's process.

Thus, the proposed combination and modification is inoperative and destroys the intended operation and the both reference processes.

8. **Even if Urruti and Yamamura or Knemochi were to be combined or modified in the manner proposed, the resultant teaching still omit one or more of the significant physical features in Claim 28** as follows:

   i. "measurement of the outer diameter of said preform above the heating and melting" out the furnace after inevitable shrinkage, in view of Yamamura and Kenmochi's measurements in the furnace;

   ii. "the control of the preform feeding speed and the fiber drawing speed of said drawing process is further based on the measured preform outer diameter, its deviation from a preselected nominal preform diameter, and said nominal preform diameter, in addition to the different measurement data sets of the bare fiber";

   iii. twice measurements of the bare fiber before coating and the control based on "the deviations of the two bare fiber measurement data sets".

9. **Yamamura does not teach measuring the outer diameter of final glass ingot after**

inevitable shrinkage. His last measurement of ingot is in furnace 10 of Figs. 1 and 5.

The final O.A. (p.9) rejects claim 28 by Urruti in view of Yamamura and comments that "Urruti does not disclose the measuring of the preform. Yamamura is cited as showing that one can monitor the preform diameter so as to better the controlling when the diameter of the preform exceeds the preset value (i.e. nominal value). See Yamamura, col. 1, lines 30-53 and col. 2, lines 64-67. It would have been obvious to monitor the Urruti preform diameter in the manner taught by Yamamura, for the advantage that Yamamura teaches."

However, please refer to above A.3.8-3.9 to see the citation from Yamamura and comments on the proposed modification. The facts clearly show that even as modified by using Yamamura to Urruti, the resultant teaching still lacks the major steps and features in Claims 28-34, e.g., measuring final preform diameter after its inevitable shrinkage, dynamically controlling a preform feeding speed and a fiber drawing speed based on the measured preform diameter, etc. Also, please see 6a, 13 and 1a, 1b and 1c in Fig. 1 and col. 1-2 of Yamamura to observe his differences and his missing significant features of the present invention.

It is clear from the above listed reasons that the above final O.A. comment is lack of reasonable basis.

10. **Moreover, only through hindsight would someone find and combine them with an inoperative combination and destroy to each other process. The modification would still omit more of applicant's claimed features. These facts further prove that the present invention as claimed is unobvious.**

C. Claims 30-34 Distinguish from and Are Patentable over Urruti 5551967 and Yamamura 6220057 or Kenmochi 6178778.

The final O.A. rejected Claims 30-34 on Urruti and Yamamura. However, even if the combination of Urruti and Yamamura were legally justified, Claims 30-34 would still have novel and unobvious physical features patentable over Urruti and Yamamura or Kenmochi.

Applicant respectfully requests reconsideration for the following reasons.

C.1. There is No Any Teaching, Suggestion, or Motivation for Combining or Modifying Features of the References. Therefore, the rejection is as being based on hindsight from the piece of the present invention.

Urruti and Yoshimura and Yamamura and Kenmochi Do Not Contain Any Justification to Support Their Combination or Modification, Much Less in the Manner Proposed. Please further refer to A.2 (pages 20-23).

C.2. Claim 30 is Unobvious and are Patentable Over Urruti and Yamamura or Kenmochi.

1. **Claim 30 Patentably Differs from Urruti and Yamamura and Kenmochi on the basis that there is (1) outer diameter measurement of preform prior to entering furnace; (2) novel control principle by utilizing preform measurement to control the preform feeding speed and fiber drawing speed. The references lack one or more of these significant features as applicant claimed.**

2. **Claim 28 is unobvious over the prior art as stated in B.3. Thus, there is no basis to reject Claim 30 for the same reason as claim 28.**

   The final O.A. (p.10) comments that "As to claim 30: it is essentially the same as the claim 28 – however it does not require the second measurement location. Claim 30 is obvious for substantially the same reason as claim 28: it would have been obvious to measure the preform diameter as taught by Yamamura, for the reason that Yamamura discloses."

   Section B.3 shows that claim 28 is unobvious. Thus, there is no any basis for the above O.A. statement to reject Claim 30. Please further refer to A.2, B.3, and the following.

3. ***Different Scope and Content* of the prior art Yamamura and Kenmochi.**

   please refer to above A.3.2.

4. **It is a well-known and clear fact that fiber manufacturing has two major distinct processes, i.e., the preform manufacturing and the optical fiber drawing. They are totally separated processes and not combined due to a lot of technical difficulties. Please refer to the prior art.**

5. **Yamamura does not teach a step of measuring the outer diameter of final glass ingot**

after inevitable shrinkage in his process.

Please refer to B.3.9 and A.3.8.

6. **Moreover, if combined or modified as the final O.A. suggests, their two process control systems would give conflict controls for preform movement, and thus destroy the references and the whole combined processes.**

   Please further refer to B.3.7 and A.3.5 for details.

7. **Even as modified or combined in the proposed manner for Urruti with Yamamura or Knemochi, and even further assumed the combination or modification workable, the resultant teaching still omit one or more of the significant physical features in Claim 30 as recited below:**

   i. "measuring a preform outer diameter by a measurement device located before a heating and melting stage" out the furnace after inevitable shrinkage;

   ii. "providing the measurement data into a control system which controls a feeding speed of said preform into the heating and melting stage and a drawing speed of said fiber";

   iii. "calculating a preform diameter deviation of the measured preform diameter from a preselected nominal preform diameter value";

   iv. "generating control signals based on the preform deviation and the fiber deviation for said optical fiber drawing process control, and adjusting the feeding speed of said preform and the drawing speed of said fiber as said control signals command".

   More important is that the control principle and method of the present invention is entirely foreign to Yamamura, Urruti, Yoshimura and Kenmochi, or any combination thereof, since the systems of these references do not use the preform measurement to control preform feeding speed and fiber drawing speed, furthermore, and the novel control principle as claimed in claims 30-34 for the control.

Therefore Claim 30 is Unobvious over the prior art from above C.1 and C2.

C.3. Dependant Claims 31-34 Are A Fortiori, Unobvious and Patentable Over the Prior Art including Urruti and Yamamura and Kenmochi

Dependant claims 31-34 incorporate all the subject matter of claim 30 and add additional subject matter which makes them a fortiori and independently pantentable.

1. **There is no basis to reject Claims 31-34 for the same reasons to Claim 28 because Claim 28 is unobvious over the prior art as stated in B.3.**

   The final O.A. (p.10) comments that "As to claims 31-34: such are obvious for the same reasons claim 28 is obvious."

   However, claim 28 is unobvious as stated in B.3. Thus, there is no basis to reject Claims 31-34.

   Applicant respectfully requests reconsideration of this rejection, in view of above B.3, C.1-C.2, and the following items of C.3.

2. **Claim 31 additionally recites:**

   "said control signals are further based on the measured preform diameter and the preselected nominal diameter in addition to the preform diameter deviation".

   This specific control principle feature is entirely foreign to Urruti, Yamamura, Kenmochi and Yoshimura, or any combination. **It clearly specifies a specific limitation of control algorithm.**

3. **Claim 32 additionally recites:**

   "locating a second bare fiber outer diameter measurement device ... before a coating device in which the fiber is coated;

   providing said control system with a second (final) bare fiber diameter measurement from the second bare fiber measurement device;

   calculating a second bare fiber diameter deviation ...; and wherein

   said control signals are further based on this second bare fiber diameter deviation, thus said control signals are based on the deviation of the measured second (final) diameter of the bare fiber coming into the coating device from the preselected second nominal fiber diameter value, the deviation of the measured first diameter of the bare

fiber leaving out the furnace from the preselected first nominal fiber diameter value, and the deviation of the measured outer diameter of the preform coming into the furnace from the preselected nominal preform diameter value".

These physical features are novel, useful and unobvious over the references.

4. **Claim 33 additionally to Claim 32 recites:**

"said control signals are further based on the measured preform diameter and the preselected nominal diameter in addition to the preform diameter deviation; and the control signals are further calculated by an algorithm for said adjusting the feeding speed by an adjustment Δv_f to satisfy

$$\Delta v_d = [v_f \cdot (2D \cdot \Delta D + \Delta D^2) + \Delta v_f \cdot (D + \Delta D)^2] / d^2$$

where ΔD is the preform diameter deviation, $D+\Delta D$ is the measured preform diameter, D is the nominal perform diameter, v_f is a predetermined perform feeding speed, Δv_d is an adjustment of the drawing speed, and d is the nominal fiber diameter".

These specific features claim the novel, useful and unobvious control principle that are disclosed in the specification of the present invention, and are entirely foreign to Urruti, Yamamura, Yoshimura and Kenmochi, or any combination thereof. It is specific limitations of control algorithm.

5. **Claim 34 additionally to Claim 33 recites:**

"control signals are further based on historical measurement data of the preform and the bare fiber being drawn over a period;

whereby the process control provides robust performance of the drawing process and robust quality of the fiber further against the fluctuations of the diameters, time-lag and time-lead of said measurements corresponding to the heating and melting stage, and environment fluctuations of the heating and melting".

This additional feature is new, useful and unobvious over the prior art to against time-lag and time-lead of the measurements.

6. **The term "base on" is a valid term and introduces specific calculations and limitations in the claims. This term has also been widely and well used in many**

claims of other patents, including Yoshimura 5073179 and Kenmochi 6178778.

The final O.A. (p.10) states "As to the limitations that refer to the control being 'based on' diameters, deviations, etc. Such is inherent. Everything is inherently 'based on' everything else. Foe example the control has to be based on each of the diameters because the amount of mass of the glass is based on the diameter, and the heat capacity is based on the amount mass, and the temperature would be based on the heat capacity. (a 2 cm diameter preform would have 4 times the mass as a 1 cm preform, and thus would need 4 times the total heat, and ¼ the feed rate. Every parameter essentially is inherently 'based on' every other parameter."

However, this statement is incorrect because Such Is Not Inherent.

For the given example, it should be also noticed that to determine the preform mass only by the diameter is not enough. Furthermore, regarding the given example, people would like to ask the following questions:

What should be based on, "the amount of mass", or weight, or "diameters", or "deviations", or "everything else"? Which one?

What is to be controlled based on "everything else", the furnace temperature distribution, or the drawing speed, or the feeding speed, or "everything else"?

What is control law or rule, i.e., principle in the process control, or "everything else"?

IT IS TOTALLY NOT INHERENT.

Control engineers need to do deep investigation and face challenging problems, e.g., in this complex optical fiber drawing process control in order to answer these questions. Different solutions may make totally different process control methods.

The present invention discloses the novel, useful and unobvious optical fiber drawing control methods in the specification and claimed in Claims 30-34.

If it were inherent, the cited references patents would not have been issued as published. This incorrect statement would reject these issued and cited reference patents.

However, Applicant highly honors these cited patents because it is not obvious and not inherent. They teach different measurements and make different controls. Applicant also

discloses and claims different new, useful and unobvious measurement methods, control methods and control principles over the prior art.

Here the important key is to identify what is based on. It is entirely not inherent.

One example can show how important and different it will be for what to be based on. Yoshimura 5073179, claim 1 claims "... the drawing being carried out at a drawing rate that is controlled based on a deviation of the measured diameter from a preselected outer diameter" [emphasis added]. Because it is based on a deviation, then a comparison operator (Fig. 2, Yoshimura) is needed, and a subtraction operation on the measurement from a preslected diameter is executed. If it were based on the measured diameter, then that comparison operator would not be needed and that subtraction operation would not be executed. This example clearly shows that the term "based on" or what to be based on is not inherent, but introduces significantly different calculations and limitations.

Really, the phrase "based on" introduces a specific control law or regulation for a control system and a control process. What to be based on for a control and what to be controlled based on that are very important issues in automatic control area, including process control, especially for very complex processes including optical fiber drawing process.

Claims 31 and 33 claim "said control signals are further based on the measured preform diameter and the preselected nominal diameter in addition to the preform diameter deviation". This novel, useful and unobvious control law, as disclosed in the specification of the present invention, is totally different from the conventional selection of a deviation only. It Is Not Inherent. This claimed phrase "based on" defines that the control signals are generated by computation on not only the preform diameter deviation ΔD, but also the measured preform diameter $D+\Delta D$ and the preselected nominal diameter D. It is not only a computation on the deviation ΔD. Thus, the claimed phrase "based on" clearly defines a novel, useful and unobvious limitation over the prior art, so that the claim distinguishes from and is patentable over the prior art.

Applicant therefore respectfully submits that the rejection to Claims 30-34 and others based on the above O.A. statement is improper and should be withdrawn since these claims are "based on" their patentable distinguished limitations respectively.

7. Claim 34 has been amended by deleting "fluctuation data from the current measurements and" and adding "of the preform and the bare fiber being drawn" to clarify "historical" measurement data and to overcome the rejection.

The final O.A. (pp. 10-11) comments that "As to Claim 34: as indicated above, the deviations are the fluctuation data that come from the current measurements. It is deemed that the broadest reasonable interpretation of the claim is that the data is from the group of current measurements and historic data. In the case of Urruti the resultant is that the selected data comes only from current measurements. However, if the claims requires fluctuation data from current measurements as well as fluctuation data from historic data: it would have been obvious to perform routine experimentation to determine the optimal starting parameters for the process. One would not expect to build the machine and program it and have it work on the first try. One would expect to perform some experimental tests to get it running. These tests would result in history data over a period. And fluctuations/changes in the data would help the artisan determine how to best arrange the process."

In claim 34, the "historical measurement data" is really time lead or lag measurement of the outer diameters as the fiber is being drawn and not history of drawing separate preforms. It is used for benefit, as stated in the claim as:

> "whereby the process control provides robust performance of the drawing process and robust quality of the fiber further against the fluctuations of the diameters, *time-lag and time-lead of said measurements corresponding to the heating and melting stage*, and environment fluctuations of the heating and melting".

To further clarify it and to take the above final O.A. comment into consideration, Claim 34 is amended as

> "The control method as claimed in Claim 33, wherein the control signals are further based on ~~fluctuation data from the current measurements and~~ historical measurement ~~history~~ data of the preform and the bare fiber being drawn over a period; ..." .

It is not related to taking extra routine experiments on other preforms. It is related to measuring the preform and its fiber which is being drawn. Thus, words "of the preform

and the bare fiber being drawn" are added to clarify that the historical measurement data are "of the preform and bare fiber" being drawn in Claim 33, not history of drawing separate performs. At the beginning of drawing, its historical measurement data are initially set zeros and then updated in the process as a common treatment for history.

On the other hand, to perform routine experimentation on other preforms than the one currently being drawn can not dynamically provide a new exact sample data on the one being dynamically drawn in real time, because the being drawn preform is not one of the previous performed preform samples, and the diameter deviation distribution of each preform along the axis is not exactly same as another preform. The experiment may provide only the statistics data or the experimented individual samples data based on the experimentation. It is not the real-time data of the being drawn preform and fiber which has not been experimented in the routine experimentation. However, control needs real-time dynamic data of the preform and the fiber being drawn, especially for robust control. It also proves that the historical measurement data of the preform and the bare fiber in the process produce benefit to reduce the time-lead and time-lag and produce unexpected results over routine experimentations for searching optimal statistical parameters.

The fact that each sample may be different due to various reasons is the key why people need robust control because of various samples, environment changes, parameter perturbations, disturbances etc. Robust control is an important research area in the control and systems in the literature. There are still so many very challenging open problems and unsolved problems in this area. The present invention is new, useful and unobvious process control methods over the prior art in the optical fiber drawing process.

Thus, applicant respectfully requests reconsideration of this rejection in view of the clarification, suitable amending, novel feature and its unexpected useful results.

D. Response to "Response to Arguments" of the final O.A.

1. Applicant's last response and arguments are valid in view of the facts and III.A-C

The final O.A. states that "Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection."

Applicant first thanks the Examiner to consider applicant's last response to the O.A. At the same time, Applicant points out that based on the facts and the above listed response in sections III. A-C, applicant's last response and arguments are strongly valid.

2. **Applicant's invention having twice bare fiber measurements in the optical fiber drawing process are novel, unique, useful and unobvious over Urruti, and produce unexpected results.**

The final O.A. states that "As to the arguments that Urruti has only one measurement between the coated and the draw furnace, see the above rejection which points out how both the Urruti measurements can be considered to be a "bare fiber'. Furthermore see the rejection which indicates it would have been obvious to remove the first coater of Urruti if one didn't want the hermetic coating."

However, regarding "bare fiber" please refer to above I.6, III.B.1.2 and B.1.4. The fact is that "bare fiber" is well described in Yoshimura, Urruti and Applicant in a same and common way. "Bare fiber" recited in Claims 26-29, 32-34 is a term of art in US 5073179 and 5551967 and it is clearly described and shown as 5 in figs. 1-10 of the application.

Furthermore, please refer to III.B.2.2 to see that to remove the first coater destroys Urruti's process purpose and damages the product quality, causing a detrimental phenomenon – stress corrosion, static fatigue, and further bonds to break down and spontaneous fractures. This function is Desired and Required, thus it can not be omitted.

Urruti's second measurement is clearly not on a bare fiber. His measurement had to apply a shadow technique for this measurement of coated fiber. More important is as stated in III.B.2.7 and B.2.3, the new twice bare fiber measurements produce new, useful and unexpected results of providing full high speed, high accuracy measurement data, defect detection needed for high speed and high quality fiber drawing process control.

3. **The present invention patentably differs from the prior art including Urruti by the claimed distinguished physical features.**

The final O.A. states "Most important, Urruti discloses the same concept that applicant has: measuring at more than one location to get better control of the diameter controlling process."

However, the fact is that Yoshimura, Urruti and Applicant Invent Different Concepts respectively to solve a long-felt and long existing problem and still unsolved need.

The present invention provides more new distinguished unobvious methods to solving more problems in fiber drawing process.

Most important concepts and issues are not only how many measuring locations, but also how to identify:

a. what to be measured;
b. where to be measured;
c. what related technique to be used for the measurement, popular or not;
d. how to utilize the measurement;
e. what to be controlled;
f. how to control, i.e., based on what; and
g. what to be the novel control principle and method as a whole.

This issue is the invention and key concepts in the present invention that patentably differs from Urruti's.

Thus, it is clear that the above final O.A. statement to reject the present invention is incorrect, and omits the most important key concepts, and doesn't recognize the important differences about the above listed concepts and issues between applicant and the prior art, including Urruti. Please especially refer to above II, III.A.2 and III.B to see claimed patentable physical features of the present invention over Urruti.

It is not obvious and no motivation to take more than one measurement of the bare fiber prior to the present invention. Otherwise, it would have been taught or mentioned by either Yoshimura or Urruti for this long-felt and long existing problem by using the same important concept of the final O.A.

If the most important concept of Urruti and the present invention were the same, there would not have the above mentioned unexpected results and benefit produced by the present invention. How to explain these unexpected results as listed in III.B.7 and B.3?

If that statement had been used for rejection, people would not have had Kenmochi

invention. How to explain Kenmochi 6178778 (2001) after Urruti 5551967 (1996)? The above O.A. statement does not recognize the difference and important issues in measuring area and control area.

Thus, applicant respectfully request that this rejection should be withdrawn.

4. **Error is the concept that "with any process, the more locations the product is monitored, the better the final product would be" in the final O.A.**

The final O.A. states

> "Examiner wish also to point out Kenmochi 6178778 which teaches drawing and measuring the diameter at 'at least locations'. Monitoring the diameter at multiple positions would typically not an invention – because it is merely repeating the same concept.
>
> From MPEP 2144.04 B. Duplication of Parts In re Harza, 274 F .2d 669, 124 USPQ 378 (CCPA 1960) .....
>
> Using the above case law: duplicating a fiber diameter sensor 'has no patentable significance' – applicant has not demonstrated any unexpected results. One would expect better control by having more sensors. With any process, the more locations the product is monitored, the better the final product would be."

However, the above statement is incorrect and against the knowledge and principles of automatic control and engineering as described below.

First, it is incorrect because the present invention is totally not a case of "Duplication of Parts". The reasons are as follows:

a. The concept of "the more, the better" as claimed in the final O.A. is incorrect and not valid for measuring in a process control system as explained below, thus there is no any ground to claim "Duplication of Parts" here.

b. It does not recognize the importance and difference of different monitor locations.

c. Yoshimura just moved one monitor location downward and that was patented in 1991 by using one monitor after CCPA 1960.

d. Urruti (1996) used two monitors and Kenmochi (2001) used two monitors after CCPA 1960. If one followed the above final O.A. concept, Urruti's second

measurement would be duplicating a sensor and his invention would be rejected, so would Kenmochi. However, they are not duplication. These were patented.

e. Duplication of parts is valid only for the same parts and they are duplicated, as well as satisfying the final O.A. concept "the more, the better" in function.

f. The key is that the above statement does not recognize the different objects or different statuses that are being measured and monitored by different sensors.

g. The statement does not recognize that the present invention sensors are taking their different tasks respectively in the measuring system and the whole control system!

h. They are totally not a duplication of parts because they are taking different tasks and responsibilities and monitoring different objects or statuses respectively.

Second, as pointed out in sections II and III.A-C, Kenmochi is in different scope, area and content, and lacks the key features in the claims of the present invention.

Third, the most important is that the above concept that "with any process, the more locations the product is monitored, the better the final product would be" in the final O.A. is incorrect for the following reasons:

i. Only monitoring will not improve the product and will not get the better product. It may observe and find more defect information, but will not solve it by more monitoring itself.

ii. The better product must be through better control method and system, not by only more monitors.

iii. Monitoring is just monitoring, just observing the process. The manufacturing process control is not a pure monitoring system, but a control system. Thus, the concept "With any process, the more locations the product is monitored, the better the final product would be" is wrong.

iv. Even assume that more monitoring would connect with a control system for a product process control, the above concept that "with any process, the more locations the product is monitored, the better the final product would be" is still incorrect for the following reasons.

v. Let's assume that the data from the above more monitoring locations are input to a control system to control the product quality. A big question and a disaster difficulty is how the control system can handle the more and more data from the more and more monitoring locations dynamically and make a correct command/decision in a limited time for a real-time process control.

vi. No control system can handle a "data sea" in a required short time period to make an on-line real-time correct action.

vii. Even, to take a simple average calculation on such large amount of data, "data sea", from more and more monitoring locations will also fail for a reasonable controller in a reasonable short time period for reasonably controlling any dynamic process.

viii. Another simple question is: how does one store or arrange the measured/measuring data ("data sea") from more and more monitoring locations for further treatment? What kind size of computer does one need for it? No amount of hardware advances will overcome this conceptual fundamental impossibility.

ix. How long of time does one need to treat one cycle of data from all monitoring locations that are more and more? There is even more evidence that striving for more and more monitors in control system may lead to nonoptimality and even wrong decision.

x. Thus, it is clear that the concept that "the more locations the product is monitored, the better the final product would be" is incorrect.

xi. Therefore, present invention regarding monitoring and control of optical fiber drawing process is totally not a case of duplication of parts because the above concept does not work for a monitoring and control system.

xii. On the other hand, the more and more monitors would also be uneconomical utilization of resources.

xiii. It is clear that some monitoring locations are not necessary and may be not useful.

xiv. Thus, what is an optimal monitoring system in a control system? Where are optimal monitoring locations? What is a best suitable control law in a complex control system? These problems are still the open and challenging problems in

complex control systems, e.g., the well-recognized complex optical fiber drawing process.

xv. It is not a case of duplication. Duplication is simple and is not an open problem, but just duplication.

xvi. The important issues are different measurement/sensor locations, different measurement objects, different feedback approaches, i.e., different controlling objects based on different measurement data sets from different locations, furthermore, different control algorithms and principles.

xvii. The above final O.A. statement is also against the practice of a series of issued patents including US 5073179 (Yoshimura), 5551967 (Urruti), 6178778 (Kenmochi) and 6220057 (Yamamura).

Accordingly, applicant respectfully submits that the rejection on this statement and these references is improper and should be withdrawn.

5. **Yoshimura 5073179 and Urruti 5443610 (a parent patent of Urruti 5551967) have been discussed in the specification of the present invention which distinguishes from and is patentable over the references.**

6. **A Substantial Feature Comparison Table is attached to show differences.**

7. **Moreover, claimed new features make new and unexpected results as follows:**

   a. **robustness to control the required bare fiber diameter against various disturbances, perturbations and deviations of the preform and preforms;**

   b. **solving time-lead and time-lag measurement problem;**

   c. **providing high speed, high accuracy data of the second measurement of bare fiber needed for high speed fiber drawing process control and defect detection over Urruti's shadow gauge; and**

   d. **reducing the processing time of Urruti.**

8. **New Principles of Operation and Control in the fiber drawing process are claimed.**

The present invention utilizes new principles of operation and control in the fiber

drawing process as disclosed in specification and claimed in the claims.

9. **A series of issued patents as cited references further prove that different measurements in a large complex process and control are challenging and unobvious to a person having ordinary skill in the art.**

   Applicant honors these references. At the same time, applicant respectfully requests the PTO to recognize his novel, useful and unobvious invention as claimed.

10. **The Invention is Unobvious from the fact in view of lack of implementation**.

    If the invention were in fact obvious, because of its advantages as also recognized in the final O.A. by suggested combination and modification, those skilled in the art surely would have implemented it early. That is – the fact that those skilled in the art had not and have not implemented the invention, despite its great advantages, indicates that it is not obvious.

11. **Professional Recognition** – The invention has been given an award and recognition by the University of North Carolina at Charlotte. (Please see the attached copy.)

12. **Competitive Recognition** – Recently, some foreign (and non-China) company filed a patent application in China, the content of that is basically similar and close to this present invention as they recognized. They have read and checked the applicant's this patent application in China, for that the applicant applied as an international patent application in 2002 following the US PTO permission notice to this US patent application. (Please see the attached copy.)

13. **Some Foreign Company Intended to Purchase the Present Invention and Application, as a factor as the U.S. Supreme Court has ruled for certain "secondary considerations".**

    An agent company contacted the applicant on behalf of that foreign company, and said that foreign company had intended to purchase the present invention and application of the applicant. (Please see the attached copy.)

14. **The above facts including the factual evidence of "secondary considerations" are**

submitted together with arguments listed above for requesting reconsideration.

IV. Respectful Request for Reconsideration

From all of the above, it can be seen that the claims of the present invention are patentable over the prior art. Therefore, Applicant respectfully requests the Examiner for reconsideration.

V. Conclusion

Following the interviews, limited amending of claims has taken without raising any new issues to correspond to the final O.A. This limited amending and the Remark is a reply to the final O.A. in view of the two new references cited and new points issued.

The present invention includes the new patentable subject matter in optical fiber drawing process. These novel, useful and unobvious claimed physical features over the prior art as a whole include: measuring preform outer diameter, using new robust control method and new operation principle involving ΔD (a deviation of a preform outer diameter from its nominal value), $D+\Delta D$ (the dynamic preform measurement) and D (the nominal value), having double bare fiber measurements at two different locations before any coating device, using new operation principle including two different bare fiber diameter measurement data sets to control the preform feeding speed and fiber drawing speed. These new claimed features make new unexpected good results as stated above.

For all of the above reasons, applicant respectfully submits that the claims are now in proper form, and that the claims all define patentably over the prior art. Therefore applicant submits that this application is now in condition for allowance, which action he respectfully solicits.

Applicant respectfully requests the PTO to view and recognize the new, useful, unobvious and patentable merit of the present invention as whole.

Applicant again expresses his hope to work out together without the need for further proceedings.

VI. Conditional Request for Constructive Assistance

Following the interviews after the final O.A. with two new cited references, especially 3-15-2005 telephonic interview with Examiner Hoffmann, applicant has limitedly amended some claims and further canceled 3 claims of this application, but without raising any new issues, so that they are proper, definite, and define novel structure which is also unobvious.

Also, if the amendments are clear and minor, applicant would have no objection to the examiner making them by Examiner's Amendment.

If for any reason this application is not believed to be in full condition for allowance, applicant respectfully requests the constructive assistance and suggestions of the Examiner pursuant to MPEP §706.03(d) and §707.07(j) in order that undersigned can place this application in allowable condition as soon as possible and without the need for further proceedings.

Very respectfully,

Sheng-Guo Wang

---------- Applicant Pro Se ----------

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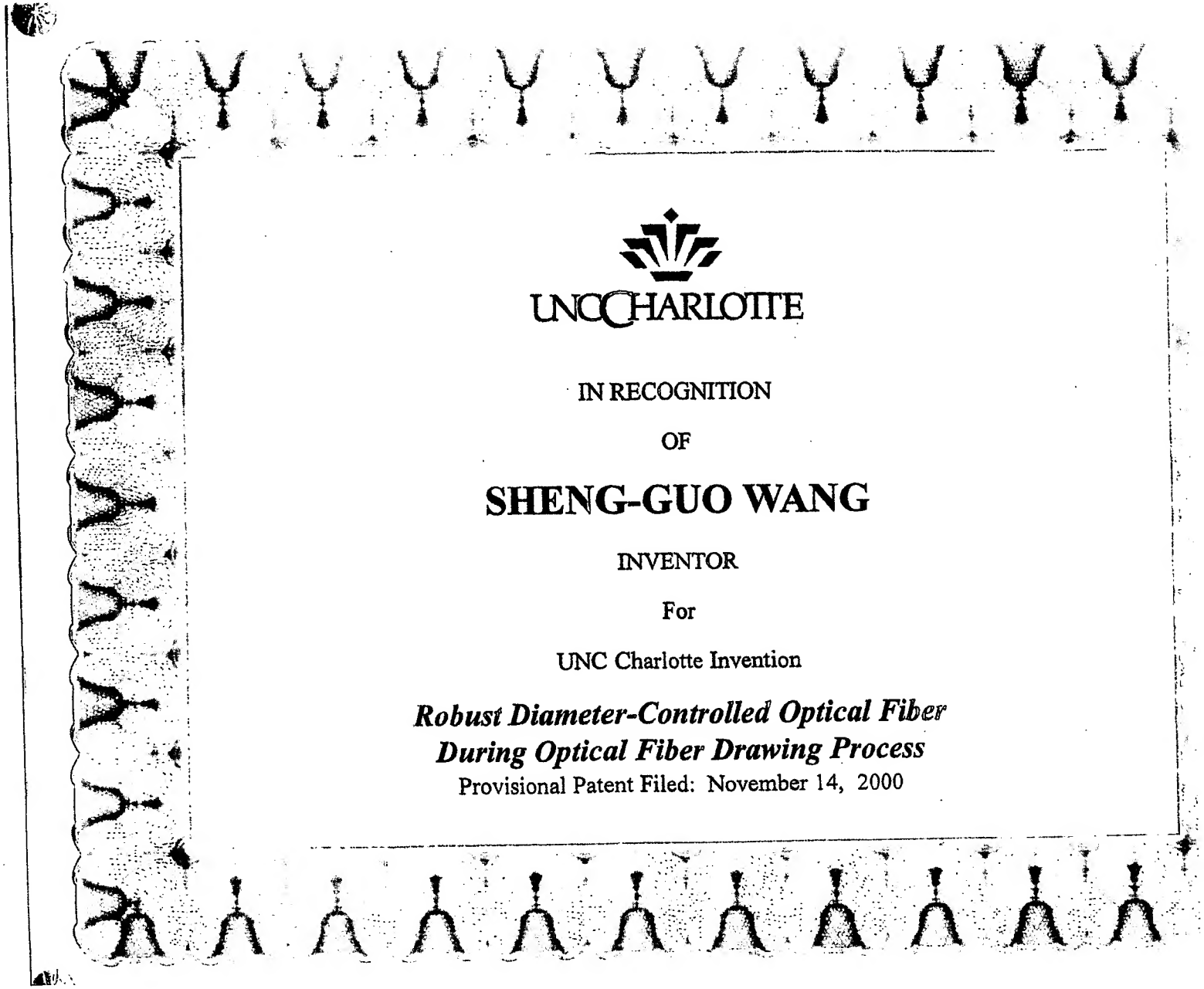
Charlotte, NC 28262
Tel: (704) 503-0747

Certificate of Mailing: I certify that on the date below this document and referenced attachments, if any, will be mailed with the U.S. Postal Service as the Express Mail – ED 300078670 US – in an envelope addressed to: "Box AF, COMMISIONER FOR PATENTS, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450."

April 7, 2005 

Sheng-Guo Wang, Applicant

	Optical Fiber Drawing Process	Measurements at different locations for fiber drawing process			Feed speed control using Preform dynamic data	Drawing speed control using Preform dynamic data	Tensor control using Preform dynamic data	Feed speed & Drawing speed control using Twice Bare Fiber dynamic data sets	New robust control method law
		Preform outer diameter	Bare Fiber Just after heating	Bare Fiber Just before coating or within limited shrinkage before coating					
The Applicant's Invention (US)	X	X	X	X	X	X	X	X	X
	X	X		X	X	X	X		X
	X	X	X		X	X	X		X
	X	X			X	X	X		X
	X		X	X				X	X
Yamamura (JP) US 6220057	Glass Ingot manufacture (2M in furnace)								
Yoshimura (JP) US 5073179	X (1 after furnace before coating)			X					
Urruti (US) US 5551967	X (1 after furnace & 1 after coating)		X						
Kenmochi (JP) US 6178778	Preform manufacture (2 M in furnace for control; another 1 M only for example check & comparison)								


UNCCHARLOTTE
IN RECOGNITION
OF
SHENG-GUO WANG
INVENTOR
For
UNC Charlotte Invention
Robust Diameter-Controlled Optical Fiber
During Optical Fiber Drawing Process
Provisional Patent Filed: November 14, 2000

深聯商業貿易進出口代理中心

地址：廣東省深圳市蛇口工業區深聯大厦　郵編：518067
電話：0755-81597411　　數碼傳真：013926580133

王胜国同志：

我代理中心通过商业贸易进出口的同时，对于无形资产联系转让给外资公司造就了难得的机会。

我代理中心在会场上安置开放了22台宽带互联网电脑，供参加会议的企业领导专门查阅高新技术信息。

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现征求你的意见，如你有意转让这一项专利权，你须于收到信的约十天内给我们回复电话：0755-81597411。此事由我们主任经办，主任手机：013554775259，传真：013926580133，（数码传真，普通传真机可接入）请你在电话联系务必说明该专利档案电脑编号：ＰＸ１７０８号。

你的专利资料是公开的，我方已在中国知识产权局查到你的该专利资料，意向方也有代表人阅过，当我收到你的联系，我会马上开展下一步工作，希望能得到你的配合。

我们向你方承诺：我单位在成功前不向你方收取任何费用，但在成功后，我方向你方收取成交总额的３%作为中介收入。

此致！

深联商业贸易进出口代理中心

联系人：[illegible]

主任：黄天成

二００四年七月八日

Shen Lian Business Trade Export & Import Agency

Address: Shen Lian Building, Shekou Industrial Zone, Shenzhen, Guangdong Zip: 518067
Tel.: 0755-81597411 Digital Fax: 013926580133

Mr. Sheng-Guo Wang:

Our Agency provides uncommon opportunities for intangible assets transfer when we are doing business exports and imports.

Our Agency has set up 22 broad-band internet-connected computers for company leaders who attend conferences to review new high-tech information.

Now there is a foreign company in our province submitting an application for a patent to the State Intellectual Property Office of PRC, that is basically similar and close to the content of your patent application "Robust diameter-controlled optical fiber during optical fiber drawing process". Your patent application has not been issued the patent certificate. However, this company manager is urgent to consider this conflict, and is willing to negotiate to purchase your this technology and patent application. With your Official Filing Receipt, it is able to start the negotiation. This company has designated our Agency to do this business.

Now we are asking for your opinion. If you have an intension to transfer this patent right, please call us at 0755-81597411in 10 days after you receive this letter. This matter is handled by our Chief Officer, his mobile phone number: 013554775259, fax: 013926580133 (this digital fax can also receive normal fax). Please indicate this patent file serial number in computer: PX 1708 when you call us.

Your patent material is open to the public. We have searched your patent material at the State Intellectual Property Office of PRC. The intended party has also reviewed your patent material. When I have got your contact, I will immediately start next stage work. I hope to have your cooperation.

We promise to you: our Agency will not charge you any costs before success, but after the success, we will charge you 3% of the total amount of the deal as an agent fee.

Sincerely,

Shen Lian Business Trade Export & Import Agency
Liaison person: Huaqing Li
Chief Officer: Tianchen Huang

July 8, 2004

(Company Stamp) **Shen Lian Business Trade Export & Import Agency**